

Selecting Wastewater Aeration for Lagoons Based on Maintenance Requirements, Efficiency, and Effectiveness



A Blackstone lagoon awaiting aeration

Overview

McHenry County, Illinois – In mid 2005, the Blackstone Development Corp. finished construction of three wastewater treatment lagoons, with a total volume of 7.4 million gallons. These lagoons, each with a depth of 10', were designed to handle an average daily flow of 33,000gpd from the housing development being erected adjacent to the plant. The addition of aeration and mixing represented the final step to the completion of the wastewater facility—but the choice of which product to use was not an easy one.

The plant's engineers desired an aeration system that offered low maintenance requirements, efficiency, and effectiveness—and rigorously evaluated the various technologies to determine the best fit for the Blackstone Development.

Two products were considered for the site during the design phase: self aspirating turbine surface aerators and MARS Double Bubble™ Aeration.



The Contenders

Surface Aeration

Just as the name states, this type of aeration is located directly on the surface of the lagoon. A motor on a float turns a sub-surface propeller, mixing the water. At the same time, some air is drawn down the propeller shaft, introducing small amounts of oxygen into the water.

Surface aeration generally comes with high maintenance requirements—each aerator contains dozens of moving parts, including a motor that needs lubrication four times per year. Considering that eight aerators would be necessary for the Blackstone lagoons, maintenance lubrication alone would have to be completed 32 times per year. Another concern Blackstone's engineers expressed was the fact that McHenry County experienced freezing winters, which can be particularly damaging to surface aerators. With its many moving parts, high upkeep requirements, and potential to freeze, surface aeration is known to break often, often unexpectedly.

When the Blackstone engineers analyzed the efficiency and effectiveness of surface aeration, they discovered that it consumes as much as 60% more energy than fine bubble alternatives. Moving water around with a propeller is more energy intensive than air. On top of this, the engineers were concerned with sludge accumulation, as surface aerators tend to have a limited zone of influence at deeper depths. After estimating that surface aeration would cost nearly \$350,000 over ten years while still mixing poorly, the engineers decided that it

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was not the right choice. An interesting point for consideration is the fact that some states prohibit the use of surface aeration for wastewater lagoons—perhaps for the same reasons discovered by the Blackstone engineers.

MARS Double Bubble™ Aeration

The MARS Aeration diffuser, with its patented Double Bubble™ technology, combines two essential components. The first component is the self cleaning fine bubble membrane, which harnesses the benefits of efficient oxygenation. Working in collaboration with this is the second component, a coarse bubble static tube aerator, which provides substantial turbulence and mixing capacities that help the MARS treat effectively. Together, these components allow the MARS to oxygenate and treat effectively while still using energy efficiently. The MARS system also features a portable design—with each MARS featuring its own weighted legs and fed air via flexible weighted tubing. It is this portability that makes the MARS versatile, making the treatment of practically any body of water available by simply lowering it in from the surface.

After an in-depth analysis, the engineers of the Blackstone WW Plant determined that MARS Aeration was best suited for the following reasons:

1. It's the Lowest Maintenance

- a. No moving parts
- b. Only 2 motors (blowers) to service
- c. Units easily removed
- d. No routine maintenance

2. It is High Efficiency

- a. Over 50% more energy efficient than surface aeration
- b. Saves thousands in energy costs

3. It is the Most Effective

- a. Thoroughly mixing with large bubble
- b. Efficiently aerates with fine bubble

Thirteen MARS Aerators have been in constant use at Blackstone since the beginning of 2006, and have performed exactly as anticipated. It is estimated that over \$130,000 dollars will be saved in a ten year period by utilizing the MARS System.

